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ABSTRACT

The College of Engineering at the University of Washington conducted a portfolio evaluation project to better understand the nature and effects of its writing project. The project was implemented to address two needs: (1) the need expressed inside and outside the college for graduates with better communication skills; and (2) the need to demonstrate that the college has a process in place that meets new accreditation criteria for communication programs in engineering schools. From spring 1997 through spring 2000, researchers compiled portfolios for 11 students representing selected departments in the college. The portfolios contained papers written for courses, reflection papers written for the project, and interview notes, surveys, process logs, and other evidence of student writing experiences. The evidence collected has provided a wealth of information, as illustrated by the case study of one electrical engineering student. As this student moved through his studies, he identified his own strengths and weaknesses as a writer and the strengths and weaknesses of the writing program in preparing him to write at school and work. In autumn 1999, faculty, student, and industry representatives reviewed evidence from the portfolios for this student and other students in the project in order to develop performance-based writing outcomes for students graduating from college and to evaluate gaps between these outcomes and the writing of students currently in the college. (Contains 1 figure, 2 tables, and 32 references.) (Author/SLD)

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March 2001

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Abstract

The College of Engineering at the University of Washington conducted a portfolio evaluation project to gain a better understanding of the nature and effects of its writing program. The project was implemented to address two needs: (1) the need expressed both inside and outside the college for graduates with better communication skills and (2) the need to demonstrate that the college has a process in place that meets the new accreditation criteria for communication programs in engineering schools. From spring 1997 through spring 2000, we compiled portfolios with eleven students representing selected departments in the college. The portfolios contain papers written for courses, reflection papers written for the project, and interview notes, surveys, process logs, and other evidence of student writing experiences. The evidence collected has provided a wealth of information, as illustrated by a case study of one electrical engineering student. As this student moved through his studies, he identified his own strengths and weaknesses as a writer and the strengths and weaknesses of the writing program in preparing him to write at school and work. In autumn 1999, faculty, student, and industry representatives reviewed evidence from the portfolios for this student and other students in the project in order to develop performance-based writing outcomes for students graduating from the college and to evaluate gaps between these outcomes and the writing of students currently in the college.

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March 2001

A Case Study of the Writing Experience of an Engineering Student as Part of a Portfolio-Based Writing Program Evaluation

The College of Engineering at the University of Washington (UW) is conducting an evaluation of its writing program, a program that includes writing assignments in two required technical communication service courses, in engineering courses, and in co-ops and other work settings.

The Portfolio Evaluation Project (PEP) was initially undertaken in response to the need, expressed both inside and outside the college, to gain a clearer picture of how well our current writing program prepares engineering students for writing in school and at work. The new ABET (Accreditation Board for Engineering and Technology) outcomes-based accreditation approach has given us yet another reason to undertake this project. ABET *Engineering Criteria 2000* require accredited engineering programs to demonstrate that their graduates have an ability to communicate effectively and that institutions have in place an assessment process with documented results.

PEP is being implemented in two phases. Phase 1 spanned three years—spring 1997 through spring 2000—and was designed to meet four objectives:

- Identify the writing status of students when the students enter the college
- Characterize the current student writing experience while in the college
- Determine student writing status when they graduate from the college
- Create performance-based learning outcomes

In order to reach these objectives, we determined at the outset that we needed detailed and comprehensive information on the nature and effectiveness of specific writing program elements and on how these elements work together as a whole. For example, no systematic evaluation had been conducted on the effects of the current technical communication service courses. Even if this information had been available, the service courses are only one part of a complex context in which students learn and practice writing skills while in their engineering departments. To get a fuller picture of this context, we needed to know the nature and number of writing assignments in all courses; the grading criteria for, student performance on, and type of writing instruction accompanying these assignments; and student perceptions of the program and of themselves as writers. Portfolios seemed to be the best way to do this.

The bulk of Phase 1 activities centered on building the portfolios and on analyzing and summarizing selected data. The portfolios and data served as the foundation for workshops held autumn 1999 in which faculty, students, and industry representatives developed performance-based outcomes for the writing program. In Phase 2, which is under way, we are collecting and assessing a larger sample of student papers from selected courses to see whether students are demonstrating competence in the outcomes developed in Phase 1.

This paper describes the rationale and procedure for Phase 1 and presents a case study of one of the students who participated in PEP.[1]

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[1] In this report, the use of "PEP" alone without reference to a particular phase refers to Phase 1 of the project.

Project Rationale

The emphasis on teaching effective communication is evident in the curriculum of colleges of engineering throughout the country, yet members of the professional engineering community express their dissatisfaction with the "match between communication skill training in college and the communication requirements of the workplace" (Vest et al., 1995, p. 11). Moreover, communication skills matter much more now because of the "growing complexity of systems and the cross-disciplinary approach to product design and manufacture" (Geppert, 1995, p. 39). Although training in colleges has become better over the years, it may not be meeting the increasingly stringent and constantly changing demands in the workplace.

In a 1996 survey of UW College of Engineering faculty, instructors rated the writing skills, on average, of their students as about 3.5 on a scale of 7 (86 out of 180 faculty responded). And the *Junior/Senior Writing Study, 1991-1993,* conducted throughout the university by the Interdisciplinary Writing Program, indicated that engineering majors at UW were not given enough writing practice and that the majority of assignments may not reflect the type of writing they will be doing in the workplace (Beyer & Graham, 1994).

Engineering Criteria 2000, the new ABET accreditation criteria, were developed because "engineering success today requires more than up-to-the-minute technical capability; it requires the ability to communicate, work in teams, think creatively, learn quickly, and value diversity" (Peterson, 1997, p. 1). Accompanying these criteria are methods to evaluate program compliance that rely less on quantitative data and more on holistic ways to evaluate innovation in curriculum—methods that assess not what courses students have taken but what they can do and how they can think and communicate.

Under the new criteria, engineering programs are required (1) to develop objectives (performance outcomes) for a number of skills, including an ability to communicate effectively; (2) to design a curriculum that ensures achievement of these objectives; and (3) to implement an ongoing internal assessment process to demonstrate achievement of these objectives and to improve the effectiveness of the program (Peterson, 1997). By fall 2001, the UW College of Engineering must demonstrate that it has a process in place to meet these requirements. Phase 1 of PEP addressed the first two requirements, and Phase 2 addresses the third requirement.

According to Witte and Faigley (1983), a writing program evaluation "must proceed from a theoretical framework that can accommodate the complex workings of a writing program" (p. 38). The ABET criteria provide such a framework. The emphasis on a process-oriented approach that allows for continuous improvement through ongoing, direct assessment reflects the current trend to define writing as an iterative problem-solving process and to assess writing skills in terms of mastery of this process (Bereiter & Scardamalia, 1987; Flower, 1985). This nonlinear, recursive, problem-solving model of the composing process is similar to the problem-solving process used by engineers in their designs:

> The more candid authors admit that engineers cannot simply work their way down a list of steps, but that they must circulate freely within the proposed plan—iterating, backtracking and skipping stages almost at random. (Flynn et al., 1990)

Witte and Faigley (1983) add other elements to the framework. They recommend that writing program evaluations include examination of the program's effect on its students,

on its instructors, and on its institutional, cultural, and social contexts. These effects can be seen in written products, composing processes, and attitudes of both students and instructors toward writing, toward themselves, and toward courses in the program. PEP complicates the evaluation process even further. We aimed not only to examine the *effects* but also to understand the *nature* of the writing program.

Given this expansive framework, can the typical pretest-posttest approach to program evaluation produce the desired information? It seems as if, at the very least, this approach should be able to measure the effects of the curriculum on student writing. Yet results of several evaluations of English composition programs using the pretest-posttest approach could not determine whether these programs improved student writing (Witte & Faigley, 1983). One reason for this inability to find effects is that the evaluation period, usually one term, was too short to measure any noticeable changes in student writing. But the primary reason is that the approach relied on controlled multiple-choice and/or impromptu writing samples to assess student performance.

Some aspects of the writing process may not be captured by multiple-choice tests and impromptu writing samples. As shown in Figure 1 (Camp, 1992), writing can be viewed as a *holistic* process consisting of generating and developing ideas, organizing, establishing connections within the text, and finding an appropriate stance for the audience (Camp, 1992, p. 49). During the process, the writer draws from a pool (*infrastructure*) of "specific but unrelated subskills," such as grammar or organizational formats, using those that are most appropriate to the particular type of writing. And the process operates within a *context* whereby writers shape their writing to serve particular functions in their lives.

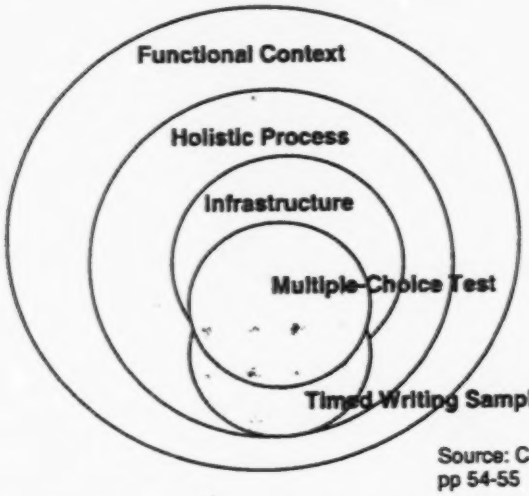

Figure 1. Components of the Writing Process

Traditional theory has defined context as the situation that motivates the writing. In this theory, the writer stands outside of the context, assessing the audience and purpose for the assignment and then responding accordingly. Recent theory places writing in a social context that includes not only the immediate situation that prompted the writing

but also the writers themselves and how they perceive and interact with the academic, corporate, governmental, and other "communities" within and for which they are writing (Barabas, 1995). In engineering, this social context applies not only to writing but also to engineering itself:

> Engineering involves not only physical reality but also a social context. People in that context can provide funding (or not), accept your ideas (or not), and buy your products (or not). The development of technology is not separable from the social, political processes surrounding it. Effective technologists have to be able to influence other people, as well as to develop efficient, useful objects. (Winsor, 1996, p. 11)

Once students start writing in their major disciplines, the discourse community of the discipline is a key component of the writing context. In contrast to the English composition tradition, content constrains writing in the discipline and makes a significant difference in the writing skills that get learned (Kaufer & Young, 1993). At first, students are "outsiders" trying to become part of a community. The knowledge of the discipline "belongs to groups of people who have some shared stake in exploring, preserving, and expanding it. The outsider must acquire knowledge from insiders, usually through some form of an apprenticeship" (Williams & Colomb, 1990, p. 101).

Often students must acquire this knowledge through observation and experience. They do not receive formal instruction in writing in their disciplines. The forms of written texts and the "ways of speaking" in the discipline are not codified. Professionals in the field and instructors in the schools are not always able to bring to the surface "the rhetorical secrets of their discipline" (Kaufer & Young, 1993, p. 101).

> Many content experts believe that writing ability in their discipline is essentially a maturational skill, something gradually inferred from practice while learning the subject matter.... There may well be populations who managed to learn the subject matter of a field to some acceptable level but who nonetheless were denied further education or entry because of inadequate training in writing." (Kaufer & Young, 1993, pp. 84-85)

Moreover, the forms of writing done in an academic setting do not mirror the forms of writing students will eventually be required to produce in the workplace.

Neither multiple-choice tests nor impromptu writing samples provide information on how the writer's context enriches and informs the process or on the higher-order thinking aspects of writing—information that is "essential to instruction and to the writer's development" (Camp, 1992, pp. 57-58). "The arguments for predictive validity of these two formats...now seem beside the point; they do not take into account what we know to be important about writing" (Camp, 1992, p. 56).

If using traditional forms of assessment does not yield the necessary information on the effects of a program on student writing, what are the alternatives? The current trends in assessment may provide insights into how to answer this question. An array of theoretical frameworks and models of assessment compatible with the new understanding of writing are being developed and tested. As a consequence, formats for reporting on performance are tending to be "more informative than are single numerical scores, including qualitative descriptions about the processes and strategies evident in the performance" (Camp, 1992, p. 72).

Portfolio assessment is one approach that is showing great promise. Portfolios are being used extensively throughout this country and in other countries for a wide range of purposes (Black, 1993; Camp, 1992; Elbow, 1991; Russell, 1995). Portfolios of student writing can be used at all levels of assessment—individual, classroom, school, district, and state—for purposes such as placement, admission, graduation, and program evaluation. Portfolios can "provide evidence of complex and varied performance in writing, of writing generated in rich instructional and social contexts, of the processes and strategies that students use and of their awareness of those processes" (Camp, 1992, p. 70).

Although assessment of student writing is critical to a successful writing program evaluation, it will not give us much insight into the nature of our program. "Program evaluation is not just large-scale writing assessment....We cannot simply import routine test procedures into program evaluation and expect them to yield results" (White, 1994, p. 267). "To evaluate a writing program unidimensionally is to engage in an activity similar to the examination of the elephant by the six blind men. If the evaluator examines only the 'trunk' of a writing program, the interdependence of all the parts will be missed" (Witte & Faigley, 1983, p. 64). Collecting and assessing student writing in combination with other more traditional methods, such as interviews, records searches, and "pretest" samples written in authentic contexts, can help evaluators gain a more holistic and integrated view of the elephant.

Procedure

Barton and Collins (1997) tell us that the design of portfolio projects for the purpose of assessing student writing should include three components: purposes, evidence (the content of the portfolios), and writing assessment criteria. These components apply to our writing program evaluation as well. One difference, however, is that during Phase 1 we substituted performance-based outcomes for assessment criteria in order to accommodate our emphasis on evaluating program performance rather than individual student performance. During Phase 2, we developed assessment criteria to track the evidence of performance outcomes in students' writing as they move through their engineering studies.

Determining the purposes of the portfolios is the first and most important task in designing a project. Clear purposes that are explicitly conveyed to students prevent the portfolios from becoming just a "compilation of student papers stuffed into a manila folder" (Barton & Collins, 1997, p. 3). Murphy and Smith (1991) list twenty-three different purposes for using portfolios to assess writing, including high-stakes purposes—such as placement in programs, admission to universities and majors, and graduation—and other purposes, such as guiding student progress in schools and classrooms, evaluating programs, helping students prepare for job searches, and improving faculty communication. Portfolios can be used to both inform and reform curriculum—as we are doing in PEP—by providing insights into not only student writing performance but also student impressions of their own work, the nature of different writing tasks, the type of writing situations in which students are most successful, and activities that work well for ESL students.

The amount and types of evidence are directly linked to the purposes of the portfolios. Assessments that carry high stakes for students may require "standard"

portfolios that contain specified numbers and types of papers. Such high-stakes assessments may also require writing samples produced in controlled settings to verify that writing samples in the portfolio were produced by a particular student. Others may require "showcase" portfolios that contain only documents that students chose for the assessment. In most writing program evaluations, student performance is used to evaluate a program rather than a student. In PEP, for example, we are interested in how students perform in the context of their school and work settings and in what students are required to do in these contexts.

The third component of portfolio assessment—writing assessment criteria—brings up the questions of validity and reliability. One of the primary reasons for using portfolios is to increase validity. "When a portfolio increases validity by giving us a better picture of what we are trying to measure (the student's actual ability), it tends by that very act to muddy reliability—to diminish the likelihood of agreement among readers or graders" (Elbow, 1991, p. xii). Readers try to turn a polyvoiced statement "whose voices are not necessarily harmonious" into a single statement of a student's ability (Belanoff, 1994, p. 23). The questions of validity and reliability are not as crucial when using portfolios to evaluate a writing program as they are when using portfolios for high-stakes assessments of student writing. In a program evaluation, the polyvoiced statements constitute valuable evidence. They provide information on the types and numbers of assignments, how the instructions for the assignments affect the quality of the writing, and whether students are meeting program performance outcomes.

In PEP, writing assessment criteria apply only in regard to how the quality of student writing reflects the efficacy of the writing program. Student papers were used as prompts to help develop performance-based outcomes, which are the program equivalent of writing assessment criteria. During Phase 2, assessment criteria were developed to assess a larger body of student papers for demonstration of the outcomes.

To meet the stated purpose and objectives of PEP, we completed four tasks: (1) solicited and selected student participants, (2) collected evidence and compiled "evaluation" portfolios, (3) maintained evidence and compiled "workshop" portfolios, and (4) created performance-based outcomes for the writing program. The project team consisted of two core researchers who were responsible for overseeing the entire project and for completing Tasks 1, 2, and 3. One unique feature of PEP is that another constituent of the project team—a group of faculty, students, and industry representatives—were responsible for Task 4, developing the performance-based outcomes.

Task 1. Soliciting and selecting student participants

The College of Engineering at the UW admits about 800 students into its ten departments and programs each year. Students usually start fulfilling course requirements for admittance to the college as early as their freshman year and are admitted to their departments at the end of their sophomore year. For PEP, we set a goal for participation of sixteen students, representing eight departments and the non-native English speaking and gender distribution in the college. Other selection criteria included recent admittance to the college and current enrollment in the introductory technical communication course.

We did not include a control group in the evaluation, nor did we seek to establish a statistical sample of student participants. Although it is likely that the compilation of their

portfolios could have influenced participating students' performance to some extent, the compilation was not considered an experimental intervention and its effects were not evaluated. Moreover, it would have been difficult to find a control group to match the sample because of the range of variables being examined for each student, including standardized test scores, courses taken to date, entry level skills, work-related writing, and so forth. Finally, portfolio collection and analysis are formidable tasks. About twenty portfolios are considered the maximum for keeping an evaluation manageable (Burnham, 1996).

Each portfolio represents a case study of the writing experience of a student in a department in the college. Case studies may not tell the whole story. There are no "typical" students. Further, each department may have divisions not covered in the evaluation. For example, civil engineering encompasses environmental, structural, and other disciplines. Case studies, however, can provide valuable in-depth insights that broader studies with larger samples cannot. PEP case studies may come closer to tracing a "typical" student's writing experience in each department than can most case studies because the rather stringent schedule of required courses in each department does not allow much variation of courses taken among students in the same discipline.

During the first week of spring, summer, and autumn quarters 1997, teaching assistants in each section of the introductory technical communication course presented PEP to their students. Students were offered four incentives for participating: a monetary stipend of $50, one credit for each of the eight or nine quarters (depending on graduation date) of participation, letters of recommendation, and assistance in polishing selected pieces of their portfolios for use in job searches. Table 1 shows the distribution of students in the project. Fourteen students volunteered; eleven remained in the project. Because mechanical and chemical engineering were not represented, we solicited oral information on the writing assignments and collected a few papers from one mechanical and one chemical engineering student shortly after they graduated in spring 1999.

Task 2. Collecting evidence and compiling evaluation portfolios

In Task 2 of PEP, we collected all writing produced for classes and work, any evidence that documented the instructional setting and student academic progress, and pieces of evidence, such as reflection papers, that students generated specifically for PEP (Table 2).

All evidence collected in Task 2 was assembled in evaluation portfolios. A complete evaluation portfolio contains the following evidence:

- **Writing produced for engineering courses and for the workplace**—any writing done in internships, co-ops, and regular employment; all marked-up copies of "reader-based" drafts (Alverno College Productions, 1990, p. 3); and a clean copy and a graded copy of the final version of each writing assignment (excluding tests but including group assignments and lab reports) produced in engineering courses to identify the number and types of writing assignments given to students

Table 1. Distribution of Students in the Portfolio Evaluation Project

Engineering Department	Native English Speaker	Gender	PEP Start Date	Graduation Date
Aeronautics and Astronautics	Yes	F	Autumn 1997	December 1999
Chemical	Yes	M	Not enrolled in PEP	June 1999 (contacted shortly after graduation)
Civil	Yes	F	Summer 1997	Graduated June 1999
Civil	Yes	F	Summer 1997	Discontinued PEP
Computer	Yes	M	Spring 1997	June 1999
Computer	No	M	Summer 1997	June 1999
Computer	No	M	Summer 1997	August 1999
Electrical	Yes	F	Autumn 1997	Discontinued PEP
Electrical	Yes	M	Autumn 1997	June 2000
Electrical	No	M	Spring 1997	December 1999
Electrical	Yes	M	Autumn 1997	June 1999
Electrical	No	M	Autumn 1997	December 1999
Industrial	Yes	F	Spring 1997	June 2000
Material Sciences and biology	Yes	F	Spring 1997	August 1999
Mechanical	No	M	Spring 1997	Discontinued PEP
Mechanical	Yes	M	Not enrolled in PEP	June 1999 (contacted shortly after graduation)

- **Summaries of one focus group and three interviews with students**—one focus group with all students who had just entered PEP in a given quarter, one individual interview in the second quarter in PEP ("entry" interview), one individual interview at the end of the first year ("mid-evaluation" interview), and one individual interview at the end of the second year ("exit" interview) to determine student attitudes toward writing, their opinions of the writing program, and the type and extent of writing assistance they receive
- **Survey forms**—one survey form to accompany the focus groups and each interview and one for each course that required writing to gather additional information that did not require the open-ended inquiry that took place in the focus groups and interviews
- **Background data from student records**—standardized test scores, previous courses, GPAs, and other data
- **Process logs**—instructions for the assignment and a written account of the student's thought processes during planning, writing, and revising (Faigley et al., 1985; Gill, 1993) to examine student awareness and use of the writing process and their metacognitive awareness of their writing skills
- **Syllabi for engineering courses taken**

Table 2. Portfolio Evidence and Related Evaluation Objectives

Evaluation Objectives	Evidence
1. Identify the writing status of students when students enter the college:	
• Identify entry-level writing skills	• Entry reflective essay; writing samples
• Examine background data, such as previous courses and standardized test scores	• Student records
• Examine students' awareness and use of the writing process and their metacognitive awareness of their writing skills	• Entry reflective essay; process logs; focus group, entry interview; surveys
• Determine students' attitudes toward writing and opinions of writing instruction	• Entry interview
2. Characterize the current student writing experience while in the college:	
• Identify writing skills in the major	• Writing samples
• Identify the number and types of writing assignments given to students in all engineering courses	• Syllabi from all engineering courses; academic writing samples; survey
• Review instructions that are given for these assignments	• Syllabi from all engineering courses; process logs
• Identify the number and types of writing completed in co-ops or engineering-related jobs	• Student workplace writing samples
• Determine the type and extent of writing assistance students receive inside and outside their courses	• Mid-evaluation interview; survey; process logs; reader-based drafts
• Identify the extent of uniformity or lack of uniformity of writing expectations and grading standards among courses in the college, especially how technical communication courses interface with other engineering courses	• Syllabi from all engineering courses; process logs; faculty survey; marked-up student writing samples
• Monitor student attitudes, opinions, awareness of the writing process, and metacognitive awareness of their writing skills	• Mid-evaluation interview; survey; process logs; reader-based drafts
• Determine faculty attitudes, expectations, and opinions of writing in the discipline	• Faculty survey and workshops
3. Determine student writing status when they graduate from the college:	
• Identify exit-level writing skills	• Student writing samples
• Examine students' awareness and use of the writing process and their metacognitive awareness of their writing skills	• Exit reflective essay; exit interview; process logs; survey
• Determine students' attitudes toward writing and opinions of writing instruction	• Exit interview; survey
4. Create and implement performance-based learning outcomes:	
• Create an environment for faculty discussion of the complexities of teaching and assessing writing, including their expectations of student performance	• Faculty workshops
• Create performance-based learning outcomes	• Faculty workshops (using data in workshop portfolios prepared by evaluation staff)
• Start to identify places in the curriculum where departments can assess student writing in terms of criteria developed on the basis of the performance-based learning outcomes	• Faculty workshops (using student portfolios and summaries of student writing in the portfolios)

- **Two reflective essays**—an entry and exit essay to examine student awareness and use of the writing process and their metacognitive awareness of their writing skills

Most portfolio projects include student reflection as crucial evidence: Reflection makes visible much in learning that is otherwise hidden, even from the student writers themselves. Through reflection, accompanied by the pertinent pieces of writing, teachers...discover how students find their way through the process of creating text, what they see as their own purpose or agenda in a piece of writing, and how they look at their work and at themselves as writers. (Camp & Levine, 1991, p 197)

Task 3. Maintaining evidence and preparing workshop portfolios

The purpose of Task 3 was to facilitate the work of creating performance-based outcomes in Task 4. For each workshop in Task 4, we assembled workshop portfolios and packets appropriate to the purpose of each workshop. One notable challenge in this process was to adopt a system of classification for papers in the portfolio and to assign papers to appropriate categories (Larson, 1991). We designed such a classification system for PEP and assigned student papers according to type of writing and writing contexts (for example, research reports, proposals, and articles—and whether these samples were written alone or in groups).

In addition to student papers, the workshop portfolios contained profiles of each student. To prepare these profiles, we analyzed, synthesized, and summarized selected portfolio evidence. Additional evidence, such as results of the faculty survey conducted in 1996, were incorporated into the evidence as needed (Table 2).

Task 4. Creating performance-based outcomes for the writing program

The purpose of Task 4 was to use the evidence and summaries to take a comprehensive look at the current writing program, reach consensus on expectations (outcomes) for student writing performance, and start to identify places in the curriculum where departments can assess student writing in terms of criteria developed on the basis of the performance-based learning outcomes (Table 2).

In Task 4, one faculty member from each of the departments in the college, two industry representatives, and one undergraduate student participated in four workshops:

- **Workshop 1—Brainstorm and negotiate preliminary performance outcomes.** Participants used student papers as prompts to brainstorm preliminary performance outcomes.
- **Workshop 2—Prepare a list of performance outcomes.** Participants reviewed a small set of student papers that filled gaps left from Workshop 1 and prepared a list of performance outcomes. While compiling and organizing the outcomes, we noticed that they represented two levels: (1) "principles," which were broad concepts about engineering writing, and (2) "qualities," which were more specific and more representative of typical performance outcomes because they could be identified and measured by examining student work. For example, one of our principles is that "technical writing is part of every engineer's career and is likely to play a major role in the quality of one's contribution to the field." One of our qualities is that the writing "clearly states its purpose, providing an explicit justification for the

document." In order to maintain the emphasis on the writing program, we worded the outcomes in terms of the writing, rather than the students, whenever possible.

- **Workshop 3—Conduct a "beta test" of the performance outcomes.** The goal of Workshop 3 was to test our draft outcomes by using them, in a rubric form, to evaluate a portfolio of student work. Participants reviewed a portfolio that included written papers (clean and graded copies) with instructions attached, interview summaries, and reflection papers. They then compared the performance outcomes list with the portfolio to map where performance outcomes were covered in the curriculum, determined whether the portfolio had demonstrated competency in the performance outcomes, and revised the list of performance outcomes.
- **Workshop 4: Finalize the performance outcomes and develop assessment plans** Participants reviewed (1) the portfolios for students in their respective departments and (2) a chart for each student that listed courses taken, highlighted courses with writing assignments, listed writing assignments, and indicated whether assignments were individual or group. After some final discussion about the outcomes, we took the participants through an example of a process that they could use to look at where in each departmental curriculum we might be able to assess the outcomes. Participants left the final workshop with the process in mind and with charts and forms in hand, ready to meet with colleagues in their departments.

Clearly, the student portfolios served a pivotal role in the development of performance-based outcomes for the UW College of Engineering's writing program. The following case study of one of the students in the project offers a glimpse of the immense amount of information such portfolios can yield.

One Student's Story

The student is a native of Thailand. English is his second language. After he came to the United States to complete his sophomore year of high school as an exchange student, he decided to finish high school in this country. So he found a program and host family in Washington state. He graduated from high school with a 3.68 grade point average (GPA) and entered UW as a freshman in autumn 1995, with no prior college experience other than one UW extension course. His adjusted Scholastic Aptitude Test (SAT) scores were 340 verbal and 600 mathematics.

While at UW, he attended school continuously throughout each year without taking summer breaks. He graduated at the end of autumn quarter 1999 after completing sixteen quarters, including a three-quarter co-op work experience in his senior year at a company that produces medical devices. Engineering students at UW typically participate in such co-ops in which they apply for employment through UW, pay tuition and receive credit for the experience, and get paid by the employers. Because of scheduling difficulties around his co-op, this student did not participate in the mid-evaluation interview.

He was registered as a pre-science major in his first four quarters at UW and as a pre-engineering major in his fifth and sixth quarters. By the seventh quarter and the start of his junior year at UW, he was admitted to the College of Engineering in the Electrical Engineering (EE) Department. When asked about the pre-science designation, he said that he entered UW without indicating a major because he thought it would be easier to get admitted that way. When he attended freshman orientation, other students convinced

him that if he became an engineer he would have no trouble finding work. From that point on, he planned to study engineering, even though he kept the pre-science designation for his first four quarters.

During his first quarter in EE, he registered for the introductory technical communication (TC) course and volunteered to participate in PEP. At that time, his future plans included getting an MBA and a Ph.D. and then running his own business. Since then, he has amended these plans. He says that through his co-op he discovered that he enjoys work more than school. He has abandoned his plans for a Ph.D. but still plans to obtain an MBA or a master's degree in engineering. He would like to find work in this country that would support his graduate studies and then return to Thailand or to find work at a company that would transfer him to Thailand where he could complete his graduate studies.

In his first quarter in PEP, the student said that he was working about 10 hours per week as a grader. When asked if working had an effect on his studies, he said that it had a small effect, mostly because he had to work more during finals and this took time away from his classes. In his last quarter at UW, he said that he worked about 20 hours per week while in the college as a computer technician in the UW library system. He said that this work definitely affected his studies. "Mostly it's because of time. I had to allocate it efficiently. For my major, I think one of the main factors in determining grades is how much time spent."

The Beyer and Graham writing studies (1992 and 1994) that followed 98 UW students through their freshmen and sophomore years and 76 students through their junior and senior years provide a means to compare this student's writing experience with other UW students, even though both studies did not include ESL students. The freshman-sophomore study (1992) indicated a "trend toward early specialization" in freshmen and sophomores (p. 15). The study also found that "general education" is not clearly defined at UW. Students took courses that could be classified as general education (not satisfying requirements for a major) only during their freshman year. For some intended majors, such as engineering, this general education ends by the third quarter of freshman year as students start to specialize in order to meet early requirements for their major.

The student in this case study generally followed this trend toward early specialization (see Appendix A). His course of study looks like this:

- First quarter—general education studies: ENGL 101 (a "high-intermediate ESL" course), three music courses, and PSYCH 101
- Second, third, and fourth quarters—mostly physics courses, with the exception of two mathematics courses; ENGL 131, a composition course required of all UW students, in the fourth quarter; and two computer science engineering courses in the second quarter
- Fifth quarter—two physics and two chemistry courses
- Sixth quarter—One math course, an engineering course (introduction to electrical engineering) and, two general education courses (PSYCH 201 and ECON 200)
- Seventh through sixteenth quarters (junior and senior years)—all engineering courses, except for an architecture course in the seventh quarter and a statistics and an art course in the fifteenth quarter

All of the physics, chemistry, and mathematics courses taken were required for his EE major. If we consider these courses as prerequisites for his major rather than as general education studies, we see that, with the exception of ENGL 131, this student interrupted his general education studies in his second quarter and resumed them in his sixth quarter. Yet this resumption consisted only of five courses over a span of twelve quarters. Five of the courses he took during his freshman and sophomore years are on Beyer and Graham's (1992) list of the ten most frequently taken courses in freshman and sophomore years by a random sample of 400 UW students.

Because students at UW do not share a common "general education," their writing experiences while at the university will vary significantly in their freshman and sophomore years and certainly after they enter their majors, usually at the beginning of junior year. Further, the pre-major writing experience may be different for students who complete some of their early quarters at other institutions, which is the case for seven of the thirteen students in PEP.

The student in this case study wrote a total of thirty-one papers while at UW. These papers were written in eleven courses out of the fifty courses taken, not counting the three co-op quarters and the three courses he took his last quarter (Appendix A). (The student submitted syllabi at the beginning of his last quarter but did not submit papers at the end of the quarter. Because we were not sure of the exact number of papers written in this quarter, we did not include them in the count.) Almost half (fourteen) of the thirty-one papers were written in the three required writing courses (ENGL 131 and two TC courses); the other half comprises thirteen papers written in engineering courses and four papers in non-engineering courses.

The following self-reporting evidence was collected and examined for this student:

- Entry reflection paper—approximately late March 1997
- Focus group and survey—held with three other students who started PEP at the same time—May 1, 1997
- Entry interview and survey—August 18, 1997
- Exit interview and survey—September 29, 1999
- Exit reflection paper—September 30, 1999
- Process logs for papers written in his first five quarters in PEP (Spring 1997 through Spring 1998)
- Surveys for each course while in EE that required writing

In addition, the student's papers were reviewed for length and type and for the number of instructor comments.

Freshman-sophomore writing experience

The following characterization of this student's writing experience in his freshman and sophomore years at UW is based on information from the focus group and survey, the entry interview and survey, and the entry reflection paper.

In his freshman and sophomore years, he wrote six papers:

- Three approximately 10-page papers in ENGL 131
- One approximately 5-page paper in PSYCH 201
- Two approximately 8-page lab reports in CHEM 141

None of these papers required library or Internet research. As indicated, the papers were written in three courses, which represent 12 percent of the twenty-five courses he took in his first six quarters. In their freshmen-sophomore study, Beyer and Graham (1992) found that 28 percent of the courses taken by students required writing, that students completed an average 12.8 papers, and that those students intending to major in mathematics, engineering, and business tended to write fewer papers. (Beyer and Graham did not report how many students in their study were intending on majoring in engineering, nor did they report the number of papers written by these students.)

What does this EE student think about his writing experience in his first two years at UW? When asked in the focus group held in the middle of his first quarter in EE (and in PEP) what he thought about the number of writing assignments he was given before entering his department, he said he was not given enough assignments. "I think in order for me to get to the level of professionals, more papers are needed." When asked what he would say if he visited his high school, he would tell teachers to teach more grammar and he would tell students that ENGL 131 is like high school English classes. Later in the interview, he did make some distinctions between ENGL 131 and high school. "In high school, we wrote about our experiences. In ENGL 131, we read texts and interpreted them." He said that the ENGL 131 sections "vary so much." He had to read "a lot" in ENGL 131. Other students who started PEP at the same time said that they did not have to read much in their composition courses. He didn't have to do research but heard that students in some other ENGL 131 sections were required to do so.

Earlier, in the entry reflection paper written about two weeks into the quarter, he indicated that ENGL 131 was his most valuable writing experience at UW. He felt that his writing abilities "dramatically improved" in this course but that he "still has a long way to go in order to speak and write as well as those who use English as their first language." The course helped him in "structure" and grammar. He thought that his first paper was quite different from his last paper in terms of his confidence in what he was doing and in terms of the quality of the paper.

A few weeks later in the focus group he was able to compare ENGL 131 with the introductory TC course. He would tell high school students that the introductory TC course is different from the English classes he has taken. It is more structured and specific. When asked if he thought that the writing assignments in his freshman and sophomore years were helping him this quarter, he said that except for the writing practice that ENGL 131 provided, his previous writing was not helping him with his assignments in the introductory TC course. "It seems like it should help more, but it just helped with structure and grammar. Otherwise, the courses are quite different." Later in his exit interview he said that the concepts learned in ENGL 131 were totally different from those learned in the introductory TC course. This is consistent with other students at UW who found that writing in their majors requires different types of writing than those required in high school and in their freshman and sophomore years in college (Beyer & Graham, 1994).

He claims that the introductory TC course is easier than ENGL 131 because students do not have to start from "scratch." "You are given guidelines that you can follow. It [the introductory TC course] feels more comfortable, more like engineering writing." In his entry interview during his second quarter in EE, after completing the introductory TC course, he said:

> Writing in ENGR 231 [the introductory TC course] is more useful and more applicable to what I'll be doing later in college and in my career than the reading and writing I did in ENGL 131, which was mainly giving your own opinion. I don't see the point. I had to think more in ENGL 131 before writing, because I had to extend an idea. The courses are the same in that they teach you how to write correctly (mechanically correct) and clearly.

When asked to describe his least valuable writing experience to date, he said that every time he writes he learns more about writing through the practice he accrues but that some experiences are better than others. In PSYCH 201, he wrote a manual on personal enhancement. The emphasis was on the content of the paper, not on the writing, and students were not provided with a prescribed format for the manual. He said that he needs to know "exactly" what is required:

> This writing does not contribute to my writing ability as much as the academic writing in ENGL 131. In this writing [PSYCH 201], I learned very little about writing papers because the class was focused on a psychology issue. In my opinion, if Psychology 201 were linked to English 131, my learning experience would have been so much better. I would learn how to apply academic writing to real life issues.

He said that writing assignments hamper his ability to learn content. Because English is not his first language, he has to spend "too much time" on the writing and does not have enough time to learn the content. At this point, he does not believe that he could write a 20-page technical paper. "It would take me forever" (1 hour per page).

How does he rate himself as a writer? Because he considers writing as one of the most difficult tasks, he rates himself as an "average" writer. "People ought to choose to learn what motivates them. Since I am not interested in writing, I usually choose not to learn, despite the fact that writing well is useful in everyday lives." He feels that he can't evaluate his own writing. He needs feedback, especially in the form of grades. He also needs much more experience. When asked to describe good writing, he equates good writing with good grades:

> I don't have high expectations. Writing should sound right. Most of what I read sounds right (except my own writing). It must be understandable. It depends on the type of writing, though. If the writer is writing for an expert and I am not an expert, I might not understand it.

His perception of the writing process of good writers is that they must be able to express themselves, to know exactly what they are talking about, and to make it clear. He says that all this is difficult. In terms of his own writing process, he has to think about what he going to write first and then produce an outline. "The writing skills are useful during the typing process. I check grammar and spelling during that time." (It is not clear what he means by "writing skills.") He expects to write lab reports in his technical courses and to write "reports" in his career.

Junior-Senior writing experience

The following characterization of this student's writing experience in his junior and senior years at UW is based on the entry and exit interviews and surveys, surveys

completed for each engineering course in which writing was required, papers produced in these courses, process logs, and the exit reflection paper and survey.

In his junior and senior years, he wrote twenty-five papers (Appendix A):

- Five papers of varying lengths in ENGR 231 (introductory TC course)
- Six papers of varying length in ENGR 333 (advanced TC course)
- One 5-page group lab report in EE 371
- Four 6-page lab reports in EE 361
- One 13-page design report in EE 331
- Three papers—one 5-page lab report, one 8-page research report, and one 2-page proposal—in EE 461
- Four lab-design reports (two group and two individual) ranging from 9 to 35 pages (a lot of code in the longer papers) in EE 472
- One 100-page report in ART 276 ("lots of pictures")

(Page counts are not exact. All were based on double-spaced text and were estimated for single-spaced papers. Counts do not include appendixes.)

The student also wrote during his co-op job, but not very much. He participated in a group project that documented the methodology for meeting a set of design specifications, and he wrote and made a presentation on new technologies. He did not add his co-op writing to his portfolio because the writing was for internal company review only

Two of the papers he wrote for courses required library or Internet research. As indicated, the papers were written in eight courses, which represent 36 percent of the twenty-two courses taken so far in his junior and senior years, not counting his co-op work experience and his final quarter. The syllabi for two of the three EE courses he took in his final quarter indicate that in the capstone design course he wrote at least two lab reports, conducted library and Internet research, and wrote short papers on other student's presentation of their research. (The third course was an independent study whose requirements had not yet been defined.)

The number of papers written (twenty-five) is greater than the average of 11.6 papers written by the twelve engineering students in the Beyer and Graham (1994) junior-senior writing study. These students, however, were not required to take the two quarters of TC courses when the study was conducted in 1991 through 1993. If we subtract the eleven assignments given to our EE student in TC courses, we have a total of fourteen papers assigned in other junior-senior courses, close to the number reported by Beyer and Graham. On average, all students in the 1994 study wrote about fourteen papers in their junior and senior years, with history majors on one end of the range (seventeen papers) and engineering students at the other end (11.6 papers).

Our EE student recollected during the exit interview that he did not write much in his 200- and 300-level engineering courses (not including the TC courses). In fact, the number of papers he wrote for 300-level and the number for 400-level courses are equal. In his exit reflection paper, he does say that most of his writing since entering the department other than in the TC courses has been in the form of lab reports for 300-level EE courses. With the addition of the papers he wrote in his final quarter, the balance would most likely have tipped in favor of the 400-level courses. He does not recommend that more writing be introduced in the lower level engineering courses because they are

theory based, do not have labs, and teach concepts that are explained in mathematical "language" that does not lend itself to writing:

> This means that students can spend more time on what would be most important in their future—understanding theories. I think instead that the department should increase the required technical writing courses since technical writing is so important.

He took the advanced TC course immediately after taking the introductory TC course. While he was taking these two courses, he felt that there were too many writing assignments in his major. His view in his final quarter reverted back to his original view when he first entered the department—that he has not written enough. More specifically, he has not written enough instructions and design reports. The type of instructions of which he needs more practice writing are the instructions that accompany written computer code. Engineers embed explanatory commands in the code, but additional written instructions are needed so that one engineer-programmer can understand, use, and amend the code written by another. But he acknowledges that "engineers don't like to write, even commands in the code. They concentrate on what they think is more important—the codes themselves."

One pivotal experience during his co-op helped him to recognize the importance of overcoming this tendency to avoid writing. He mentioned the experience several times in the written and oral evidence he produced after the co-op. In the co-op, he had written computer code and had explained the code orally to staff before he left the job to return to school. He learned afterward that the staff "didn't use the code because they didn't have enough instruction."

> In the co-op I realized just how important technical writing is. I believe my technical knowledge while in the co-op was much higher than how much I could communicate about it. In fact, one of my projects was later "abandoned" after I left because of poor documentation!!! (his punctuation)

So on the one hand, the student says that understanding theories is most important but, on the other hand, recognizes that communicating about technical knowledge is important too.

Writing lab reports, which constitutes the predominant genre in his EE courses, was "not useless, nor useful" in that it provided an opportunity for practice in writing in general but is not directly applicable to the type of writing he will be doing in the workplace. His co-op experience helped him to decide that he would like to become a product designer rather than a product tester. This may be one reason why he expressed a need for more practice in design reports. In the exit interview, he said that he has written only one design report (in EE 472) and that he would like to have been given the opportunity to take design courses earlier. (Later, as we were trying to classify his papers, he realized that the four papers in EE 472 were more like hybrids between lab and design reports and that he had written a design report two quarters earlier in EE 331.)

He says that he can compensate for this lack of formal instruction in the craft of writing instructions and design reports by reading instructions and design reports written by others:

> As I read a good design or an instructional paper, I often memorize sentence structures and approaches that the author used in explanation.... Although I did not

have to write much instruction manuals, it does not mean impossibility of improving.... It may not be as useful as writing them myself, but I believe it surely is helpful to a certain level.

He cites as a good model for learning how to write instructions and design reports his initial experience of learning and applying how to write research reports in his introductory TC course and then practicing the skills in EE courses. This instruction-practice sequence will help him write in the "real world." He learned how to write instructions in the introductory TC course, but did not get the opportunity to practice writing them in his EE courses. He felt that neither the introductory TC course nor the follow-up advanced TC course covered design reports. He went on to say that linking EE courses with writing courses would serve as an even better model. There is too much to learn and not enough time (or credits) in EE courses to allow for instruction in writing. A linked writing course would provide the needed instruction and time. Moreover, the subject matter of the writing assignments would be more relevant to him than that required in the TC courses:

> In the technical communication courses, I spent too much time learning the content of what I was supposed to write about and not enough time on the writing. It's much more interesting to write about a design or other project that I've been involved with, rather than getting up to speed on content that doesn't hold my interest or that I don't understand.

He has remembered and applied the general concepts, such as audience and tone, that he learned in his TC courses. He says that these concepts make sense and that they are "subconsciously" understood by engineers, even though engineers may "have a problem in knowing exactly what to say to get their points across to a certain audience." Audience is a "big point" that he had not considered before taking the TC courses. With the exception of one course that required a variation on the research report guidelines taught in the introductory TC course, writing expectations in his EE courses were generally consistent with the concepts taught in the TC courses. He describes instructor expectations in his EE courses as follows:

> All engineering instructors have a common goal for the papers: to see whether students understand the material. Students have to provide answers and explanations. Writing is not just content and grammar; it's communication. Content and grammar, of course, help a lot in the communication.

He maintained that without the instruction provided in the TC courses, he "wouldn't be able to survive out there." He can now answer with confidence when asked to describe a good writer, and he feels that knowing what it takes to be a good writer is helpful. Before completing the introductory TC course, he defined good writing in terms of good grades, "sounding right," and being understandable to readers. Immediately after completing the course, his definition of good writing reflected some of the terms and concepts he had just learned:

> Good writing satisfies the *purpose* of the paper and is *mechanically* correct. If all the *content* is there but the spelling is incorrect, it will be distracting. The *layout* and *design* are also important. The paper must be complete. If you need to explain A and

B and you only explain A, then it is not complete. It's not like speech where someone can ask a question.

He defined technical writing as writing about the "truth" of the situation, not about one's own opinions and that technical writers help the audience find information quickly by providing headings in the text. In his exit interview, he did not use the specific TC terms learned but touched on some of the concepts: "Good writing is clear, concise, gets right to the point, is error free, smooth, and easy-to-read. And all the things I told you in the first interview" [laughs]. Eight quarters have elapsed since he took the advanced TC course. He attributes some of his lapse in memory to EE instructors who "just concentrate on a particular thing, an answer to a question, for example, rather than on the writing itself. Students tend to forget what they learned in technical writing classes. They lose concentration on the actual writing and focus more on the content."

The same trend is seen in his description of what good writers do when they write. His earlier assertion that they must express themselves well, that they must know what they are talking about and make it clear, is replaced by the following directly after taking the introductory TC course:

> Good writers search for information first; they also need to know the *purpose* and *audience* before they start writing. Then they should have an idea of what they want to write. An excellent writer will also be mechanically correct. I'm not good at *mechanics*. Good writers write the paper early and let it sit a while before *revising*.

In the exit interview, he emphasizes content, which is what his engineering instructors stress in their feedback on writing assignments. He says that good writers have to find out exactly what they will be writing about in advance. He brings in his own experience by saying that he has found that he must know what he is going to write about before he starts to write; otherwise, it will not look professional. It will not be smooth or flow well. He does concede that the act of writing may help him identify gaps in his information. When writing lab reports, he sometimes would discover that he did not have enough data and would have to redo the lab. If he knows his subject well, he does not have to concentrate as much on what he is writing and can pay more attention to how he constructs the sentences. "If you're a good writer and know exactly what you're going to write, it will always turn out right." When prompted about revising, he acknowledges that a good writer must proofread and revise if it is a final product. (His entry reflection paper showed more evidence of proofreading than did his exit reflection paper.)

With the exception of EE 361, he received little direct instruction in how to complete writing assignments in his EE courses. To explain his low ratings for the quantity and quality of the of instruction on his writing assignment in a 400-level EE course, he said, "The research paper was not talked about much. I think the professor expected her students to write by themselves." When asked how much class time was spent on the writing assignment for a 300-level EE course, he said, "Not at all! Well, maybe for about 5 seconds." Interestingly, he said he never asked for assistance from his instructor or teaching assistant while completing his writing assignments in all EE courses except EE 361, the one in which he was satisfied with the quantity and quality of the instruction. Of this course, he said, "The instruction was quite clear and always got right to the point."

The instruction in EE courses, if any, came in the form of "templates" listing titles of sections and subsections to be included in the papers. He said that without such a template, he had to ask a lot of questions and did not feel as confident in writing the paper. "If you're going to have the writing component, you should indicate what a good paper is, you should share your expectations." He did not include an example of such a template in his portfolio, perhaps because the templates were given orally. The following is an example of written instructions that he did provide:

On the project due date, turn in a hard-copy project report in class (suggested length: 3-5 pages, NO handwriting please). The report should include:

- *Objective of the project.*
- *Brief explanation of what you have done in the project, why you did it.*
- *Answers to the questions in the project handouts.*

Feedback on the EE papers themselves served as another primary form of instruction. Many of the papers were reviewed by graders or teaching assistants. "The TAs did not explain the writing part." He mentioned several times that he learned lessons from the feedback on the first paper in a course and applied the lessons to subsequent papers, although the feedback could be minimal at times. He said that instructors in his EE courses usually did not mark minor errors, such as spelling, but did mark larger errors, such as sentence fragments. They were mostly concerned with the content, whether students understood the material and could "get their point across." Sometimes he understood the material but was not able to make it clear in his writing.

The quality of the feedback, the grade, and the motivation to improve seemed to influence how carefully he reviewed the instructor's comments on a paper. "As for the last one, I skimmed through it very fast and didn't really care what was going on because I got 100 percent already." He often did not pick up the graded copy of the final paper in a course (and thus we do not have them in the portfolio). In addition to helping him learn what the instructor expected, the comments helped him to understand the subject. "My instructor (EE 361) wrote comments about the subject mostly. The comments were quite helpful for understanding of the subject." He said of another EE course: "I value every comment given because they are very limited! Often, I would like to know why and how my paper can be improved as well as any misconcepts [sic]."

Whereas EE teachers were mostly concerned with content, his ENGL 131 instructor was mostly interested in the English—the writing—not on whether students were getting the point across. In both the TC courses, instructors were concerned with everything—the sentence structure and the process or approach used to get your point across. The advanced TC course, however, "is more toward going out to work in the real world, which was quite useful to me as I left school to do an internship." Of the feedback in his introductory TC course, he said: "She helped me a lot. I think I would not survive writing this article without her. She explained every single detail about the article. She even offered to teach PageMaker to my classmates." Of his advanced TC course, he said: "[The instructor] wrote lots and lots of comments, but I wouldn't say it was 'excessive' because all of them were very helpful." They made me learn a lot more out that class." (He received a 3.4 in the introductory and a 3.3 in the advanced TC course.)

In regard to the writing process, it appears that the TC courses were the only courses for which he developed outlines and wrote drafts. Some of the assignments in his TC

courses required students to bring drafts to class for peer review, but he indicated that he wrote several drafts for the other papers as well. For his first EE course that required writing, he said that he was concerned about the writing style itself (grammar—"the English part"). As he grew to realize that instructors were mostly interested in content, he said that the writing became easier. "The writing was easy (knowing that the instructor won't care too much on the mechanics)." It was easy, too, because he understood and enjoyed the material. He also indicated that he did not include many explanations in his EE papers because his audience was the TA or instructor. "I assumed that the grader knows all the networking terms (which he does), so that I did not have to explain them."

Other than the instructions assignment in the introductory TC course, he did not enjoy group projects. The reason he enjoyed the instrtuctions project was that he did not write any of the text. He was responsible for formatting the article. In his EE courses, he often took on more responsibility for written products than did his partners and resented this added work. When he had better partners, the projects were more enjoyable. He described an intricate system in which one does not turn down a friend, even if that friend will not make a good project partner, and one does not complain to the instructor about his partners.

How does he rate himself as a writer now that he is ready to graduate? From an "engineering perspective," he can write clearer lab reports than when he first entered the department. He is not as sure about his writing from an "English perspective." He says that although he had plenty of technical writing experiences in the college, most of the lessons learned were not directly applicable to his intended career.

> Right now, I do not think that I have the ability to write a design article that clearly explains a design. I believe that will be changed once I start working again. At the end, I believe I have discovered the path I need to take to become a good writer in my field.

Analysis of this Student's Writing Experience

The student's comments on content are revealing. He indicates that he had problems generating content in ENGL 131 ("extending" an idea). This problem could be attributed to inexperience as a writer. The student, however, attributes it to his lack of interest and involvement in the content. The answer could lie somewhere in between.

What *does* interest this student? He appears to be motivated by whatever is practical, whatever feeds directly into his career. He does not see the value in writing for writing's sake, or in generating content for writing's sake. What is the point of writing your opinion? Content is the result of a concrete activity: learning a new concept, conducting an experiment, or designing a product. On several occasions, he says that the writing is easy because he is writing about content that is relevant and that he knows and enjoys. He underscores the point by saying that he wants to learn technical writing by writing about what he is learning and doing in the journey to reach his goals, not by writing about irrelevant instructor-generated topics. This is consistent with the finding that UW students learn the most about writing from courses in their majors (Beyer & Graham, 1994).

On the other hand, when asked about the 100-page paper he wrote for an art class he took senior year, he said it was easy. One reason was that it had lots of pictures. A more interesting reason was that he was writing about his "sentiment," that the "ideas just

flowed," and there was no "correct." This is a striking contrast to his view of having to write opinion papers in ENGL 131. Now, he is less reluctant to express his opinions and even finds it easy to do so. This change seems to indicate some maturity as a writer and some comfort with ambiguity.

Before completing the TC series and before his co-op experience, he said that writing got in the way of learning content. He had to spend too much time in concentrating on the writing itself. This may also be a characteristic of inexperienced writers, but he attributes it to the fact that English is his second language. In most of his EE courses, he finds the writing does not interfere with the content because he does not pay much attention to the writing. He sees that having to write can help in learning content—in identifying what more information needs to be gathered and understood.

Throughout his involvement in PEP, he seems to have a strong metacognitive grasp of his strategies for improving his writing (instructor feedback and reading other's writing), of what he needs to feel confident in tackling assignment (clear expectations and templates), and of the stages in his writing process (learning content first, outlining, and so forth). Yet he uses these strategies only when they reap rewards, primarily in the form of good grades. When writing well is not rewarded and writing correct information is rewarded, he will concentrate on content only.

In other areas, we see an upward trend in his confidence as a writer and in his descriptions of writing shortly after his introductory and during his advanced TC courses and a downward trend later when interviewed in his last quarter at UW. For example, his confidence as a writer seems to buoy after taking the introductory TC course. He also feels more confident in his ability to identify and describe good writing. This is substantiated by the more sophisticated descriptions of good writing provided in interviews and his use of technical writing terminology in these descriptions. His confidence wanes somewhat after completing his co-op experience. It does not seem to be a lack of confidence in his writing ability in general as it is in his ability to write in particular genres. His descriptions of good writing also diminish somewhat in sophistication in regard to furthering his adoption of terms used in the discourse community of technical writing. However, he includes his own experiences in the descriptions, indicating an internalization and deeper understanding of the concepts he has retained. (The one idea repeated most often is "getting the point across").

He identifies discrepancies between his earlier writing experiences and those in his department. The earlier writing did not prepare him for writing in his major. Beyer and Graham (1994) found that all majors they studied other than English require kinds of writing that students have had no prior experience with in high school or the first two years at UW. Writing in his major seems to contribute to his initiation into the community of engineers. According to Beyer and Graham (1994), " as students move through their majors, they begin to identify 'good writing' and themselves as competent writers with writing practices in those majors" (p. 71). He talks about "engineering writing," how engineers avoid writing, and how they subconsciously use technical writing concepts. When asked if writing has helped him get practice in how engineers think and write, he says that if he had not taken the TC courses he "wouldn't be able to survive out there."

In terms of curriculum, he has been given enough writing practice but not in the genres that he will be using most in his career. In EE courses, he did not receive explicit

reinforcement of the concepts learned in TC courses or instruction in writing, with the exception of templates. He therefore adopted strategies to compensate for this lack of instruction. The desire for more writing instruction was also expressed by engineering students in the Beyer and Graham (1994) study. One engineering student in the study said, "I've never had any instruction about writing to speak of from a[n engineering] instructor" (p. 66). Another student said that the TAs just look for information, not the way the paper is written, and check it off as they find it. (The only feedback on some of the papers in the portfolio for the EE student described in this report was a grade on the top and check marks throughout the paper.) Beyer and Graham (1994) speculate on why engineering students felt this way, despite the fact that the number of papers engineering students wrote was about the same as many of the other majors and that students in other majors did not express the need for more writing and writing instruction:

> We believe the difference...is the result of the types of papers engineering majors are asked to write—mostly informative, mostly lab reports, and often written with others. It is possible that these kinds of papers, as well as how they are traditionally evaluated, make...engineering majors' writing experience less satisfactory than that of other majors.

Information from the interviews of other PEP students echo this student's experiences. Although students do not look forward to taking the introductory TC course, they recognize its value once they have completed it. They feel that they received enough instruction to complete their assignments in their departments and that they are better writers than before they took the course. Responses to questions about what constitutes good writing and the differences between technical writing and other types of writing indicate that students are entering into the discourse community of technical writing. Students stressed the importance of keeping other things in mind besides content, including maintaining an awareness of the audience throughout the writing process, following standard "formats" for different types of writing, and writing to fulfill a specific, practical purpose.

Other than in research and lab reports, students have not had much opportunity to apply their newly acquired writing skills. They simply do not write much in their technical courses. When they are required to write, the emphasis is on content. They receive little or no instruction in writing and often learn only through feedback on their completed writing. Students report that instructors expect them to have the requisite writing skills to fulfill their assignments. One student said, "Now I know why ENGR 231 [introductory TC course] is so important. There is no opportunity to learn these skills in other classes."

We received mixed responses to a question on whether the college should be doing more to improve student writing skills. Some feel that the emphasis on learning content is well placed; others would like the college to require more writing courses. After over a year in his department, one student still was not clear on what type of writing he will be doing in his career. Another student agreed:

> The college needs to educate students on the importance of technical writing. Students assume that writing won't be needed in the workplace, but solving engineering problems is only half of the work. They have to report and communicate their work to others.

Of course, it is not fair to compare—in terms of the amount and type of instruction and feedback given—engineering courses to courses where writing is the primary subject. It would make sense, however, that some of the general concepts related to the writing process be reinforced through reminders and through grades. If papers that contained numerous mechanical errors were not accepted, students would make the effort to correct those errors on their own by seeking additional help in a writing center or elsewhere. Finally, group projects, if done correctly, can promote the development of important teamwork skills necessary for the workplace. If done incorrectly, they can allow students to do very little writing by relying on their teammates to do it. The resulting bad feelings on the part of students who carry the writing burden can distract from the learning that could occur.

Lessons Learned About Portfolio Evaluations

Throughout PEP, we have felt like explorers forging through new territory. We could not find much "how to" material on writing program evaluations or many examples of evaluations that have gathered a rich assortment of contextual evidence. Despite the minefields we encountered along the way, we are heartened by the information we compiled and examined to satisfy the first three objectives of PEP—to characterize the writing status of students before, during, and at the close of their studies in the UW College of Engineering. We hope that others, particularly those in engineering schools who must also meet ABET criteria, will benefit from our mistakes and triumphs when they are designing processes for their own writing programs.

If we were asked to volunteer one piece of advice for other portfolio project developers, it would be to constantly remind yourselves that you are not assessing the students. You are **evaluating the program!** It is easy to forget this objective and to look at individual student performance instead of using the aggregate of student performance to determine outcomes for the program **based** on examples of student performance and on how we would like students to perform.

Longitudinal studies such as PEP require much time, effort, and dedication from both the study team and student participants. The incentives for project participation are small in comparison to what we were asking of students and in view of the demanding requirements of their majors. We learned that the incentives offered did not compel students to stay in the project. Many did not even register for the one PEP credit each quarter, nor did they ask for help in polishing papers. What did seem to motivate them was the desire to make a difference for future students in the college, the opportunity to talk about their experiences and to give their opinions, and the regular contact throughout their two years with the same people who express interest in what and how they are doing.

Even after we came to understand and to provide the motivation that the students seemed to need, the students did not provide all the evidence asked of them. They did not always pick up the graded copies of their final papers if the papers were not available before the end of the quarter. Although students told us about their co-op writing experiences, they did not submit the writing because most of the work was considered proprietary. Moreover, we found that the process logs were too daunting for students to complete for each writing assignment. Obtaining permission from students to collect final

graded papers from instructors and shortening the process logs may have mitigated these problems to some extent. In any event, the graded papers and process logs that we did collect, combined with all the other evidence, gave us sufficient information to satisfy the objectives of the project.

Satisfying our fourth objective—to reach common performance-based outcomes—was not easy either. Yet the workshops were well worth the effort. In addition to meeting the stated objective, they achieved a "hidden" objective—to lay the foundation for an ongoing community of discourse around writing in the field of engineering. "Communities of discourse only exist to the extent that they are earned through time and turmoil" (Belanoff & Elbow, 1991, p. 21), but it is impossible to develop "successful educational programs, pedagogies, and assessments without at least a baseline of shared knowledge and underlying principles" (Lovitt & Young, 1994, p. 335). The rewards of such a process are numerous and surprising (Beyer & Graham, 1992; Hamp-Lyons & Condon, 1993; Hewitt, 1993; Russell, 1995). The process uncovers assumptions and differences in standards; it promotes greater communication, consensus, and collaboration among faculty; and these faculty "carry some of this collaboration and community back into the classroom" (Belanoff & Elbow, 1991, p. 22).

References

Alverno College Productions. (1990). *Portfolio assessment at Alverno College.* Milwaukee, WI: Alverno College Productions.

Barabas, C. (1995). *Technical writing in a corporate culture: A study of the nature of information.* Norwood, NJ: Ablex.

Barton, J., & Collins, A. (Eds.) (1997). *Portfolio assessment: A handbook for educators.* Menlo Park, CA: Addison-Wesley.

Belanoff, P. (1991). The myths of assessment. *Journal of Basic Writing, 10* (1), 54-66.

Belanoff, P. (1994). Portfolios and literacy: Why? In L. Black, D. Daiker, J. Sommers, & G. Stygall (Eds.), *New directions in portfolio assessment: Reflective practice, critical theory, and large-scale scoring* (pp. 13-24). Portsmouth, NH: Boynton/Cook.

Belanoff, P., & Elbow, P. (1991). Using portfolios to increase collaboration and community in a writing program. In P. Belanoff & M. Dickson (Eds.), *Portfolios: Process and product* (pp. 17-36). Portsmouth, NH: Boynton/Cook.

Bereiter, C., & Scardamalia, M. (1987). *The psychology of written composition.* Hillsdale, NJ: Lawrence Erlbaum.

Beyer, C., & Graham, J. (1992). *The freshman/sophomore writing study: 1989-1991.* Seattle, WA: University of Washington, Interdisciplinary Writing Program.

Beyer, C., & Graham, J. (1994). *The junior/senior writing study: 1991-1993.* Seattle, WA: University of Washington, Interdisciplinary Writing Program.

Black, L.C. (1993). Portfolio assessment. In T.W. Banta and associates, *Making a difference: Outcomes of a decade of assessment in higher education* (pp. 139-150). San Francisco: Jossey-Bass.

Burnham, C. (1996). *GenEd writing program outcomes assessment report: ENGL 111G.* Memorandum to Reed Dasenbrock. New Mexico State University.

Camp, R. (1992). Changing the model for the direct assessment of writing. In M.M. Williamson & B.A. Huot (Eds.), *Validating holistic scoring for writing assessment* (pp. 45-78). Cresskill, NJ: Hampton Press.

Camp, R., & Levine, D.S. (1991). Portfolios evolving: Background and variations in sixth- through twelfth-grade classrooms. In P. Belanoff & M. Dickson (Eds.), *Portfolios: Process and product* (pp. 194-205). Portsmouth, NH: Boynton/Cook Publishers.

Elbow, P. (1991). Forward. In P. Belanoff & M. Dickson (Eds.), *Portfolios: Process and product* (pp. 194-205). Portsmouth, NH: Boynton/Cook Publishers.

Faigley, L. Cherry, R.D., Joliffe, D.A., & Skinner, A.M. (1985). *Assessing writers' knowledge and processes of composing.* Norwood, NJ: Ablex.

Flynn, E.A., & Jones, R.W., with Shoos, D., & Barna, B. (1990). Michigan Technological University. In T. Fulwiler & A. Young (Eds.), *Programs that work: Models and methods for writing across the curriculum* (pp. 163-180). Portsmouth, NH: Boynton/Cook Publishers.

Flower, L. (1985). *Problem solving strategies for writers* (second ed.) New York: Harcourt.

Geppert, L. (1995). Educating the renaissance engineer. *IEEE Spectrum, 32* (9), 39-43.

Gill, K. (Ed.), and Committee on Classroom Practices. (1993). *Process and portfolios in writing instruction.* Urbana, IL: National Council of Teachers of English.

Hamp-Lyons, L., & Condon, W. (1993). Questioning assumptions about portfolio-based assessment. *College Composition and Communication, 44* (2), 176-190.

Hewitt, G. (1993). Vermont's portfolio-based writing assessment program: A brief history. *Teachers & Writers, 24* (5), 1-6.

Kaufer, D., & Young, R. (1993). Writing in the content areas: Some theoretical complexities. In L. Odell (Ed.), *Theory and practice in the teaching of writing:*

Rethinking the discipline. Carbondale and Edwardsville, IL: Southern Illinois University Press.

Larson, R.L. (1991). Using portfolios in the assessment of writing in the academic disciplines. In P. Belanoff & M. Dickson (Eds.), *Portfolios: Process and product* (pp. 137-149). Portsmouth, NH: Boynton/Cook Publishers.

Lovitt, C.R., & Young, A. (1994). Portfolios in the disciplines: Sharing knowledge in the contact zone. In L. Black, D. Daiker, J. Sommers, & G. Stygall (Eds.), *New directions in portfolio assessment: Reflective practice, critical theory, and large-scale scoring* (pp. 334-346). Portsmouth, NH: Boynton/Cook.

Murphy, S., & Smith, M.A. (1991). *Writing portfolios: A bridge from teaching to assessment*. Markham, Ontario, Canada: Pippin.

Peterson, G.D. (1997). *Engineering Criteria 2000:* A bold new change agent. American Society for Engineering Education. http: www.asee.org/publications/html/2000gold.htm. (22 Oct. 1997).

Russell, D. (1995). Collaborative portfolio assessment in the English secondary school system. *The Clearing House, 68* (4), 244-247.

White, E. M. (1994). *Teaching and assessing writing* (2nd ed.). San Francisco: Jossey-Bass.

Williams, J.M., & Colomb, G.C. (1990). The University of Chicago. In T. Fulwiler & A. Young (Eds.), *Programs that work: Models and methods for writing across the curriculum* (pp. 83-113). Portsmouth, NH: Boynton/Cook Publishers.

Winsor, D.A. (1996). *Writing like an engineer: A rhetorical education*. Mahwah, NJ: Lawrence Erlbaum Associates.

Witte, S.P., & Faigley, L. (1983). Evaluating college writing programs. Carbondale and Edwardsville, IL: Southern Illinois University Press.

Vest, D., Long, M., Thomas, L., & Palmquist, M. (1995). Relating communication training to workplace requirements: The perspective of new engineers. *IEEE Transactions on Professional Communication, 38* (1), 11-17.